

Patent  
10/010,484

REMARKS

Claims 1-16 are pending in the application with Claims 17-21 withdrawn from consideration due to a restriction requirement. Claims 1 and 16 are the only independent claims.

Applicants thank the Examiner for the indication that the arguments presented on 7/2/03 were persuasive and the withdrawal of the rejection of Claims 1-16 under Section 103(a) as being unpatentable over US Patent 4,893,160 (Hshieh et al.) in view of US Patent 6,251,730 (Luo) and further in view of Applicants' alleged admitted prior art (APA).

Claims 1-16 were rejected under Section 103(a) as being unpatentable over Applicants' alleged admitted prior art (APA) in view of US Patent 6,251,730 (Luo). This rejection is respectfully traversed and reconsideration is requested.

Independent Claim 1 is directed to a trench MOSFET transistor device having a silicon substrate of a first conductivity type, a silicon epitaxial layer of the first conductivity type over the substrate, the epitaxial layer having a lower majority carrier concentration than the substrate, a trench extending into the epitaxial layer from an upper surface of the epitaxial layer, an insulating layer lining at least a portion of the trench and a conductive region within the trench adjacent the insulating layer. The device further includes a body region of a second conductivity type provided within an upper portion of the epitaxial layer and adjacent the trench, a source region of the first conductivity type provided within an upper portion of the body region and adjacent the trench, and an upper region of second conductivity type within an upper portion of the body region and laterally adjacent the source region, wherein the upper region does not extend to the trench, and wherein the upper region has a higher majority carrier concentration than the body region. Finally, Claim 1 recites a source contact region disposed on the epitaxial

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layer upper surface, the source contact region comprising: (a) a doped polycrystalline silicon contact region in electrical contact with the source region and (b) a metal contact region adjacent the doped polycrystalline silicon contact region and in electrical contact with the source region and with the upper region.

The Final Action takes the position that APA teaches each of the elements of Claim 1, but “does not disclose the source region comprising: a doped polycrystalline silicon contact region in electrical contact with said source region”. The Action then states that “Luo discloses the source contact region 13b comprising: a doped polycrystalline silicon contact region in electrical contact with said source region 13b and a metal contact region 33 adjacent the doped polycrystalline silicon contact region 13a and in electrical contact with the source region 13b and with the upper region” (noting lines 56-67, column 4 and lines 44-46, column 7, figs. 4, 7, 8, of Luo).

The Action then states that it would have been obvious to one of ordinary skill in the art to “form the APA’s device” having the recited source contact region...”in order to avoid a high resistance in the shallow source region”.

Applicants respectfully submit that Luo fails to provide the teachings acknowledged to be missing from APA. Specifically, Luo *fails to teach or suggest* a “source contact region comprising (1) a doped polycrystalline silicon contact region in electrical contact with (2) the source region. Applicants clearly recite the following as *two distinct* elements

- (1) the doped polycrystalline silicon contact region; and
- (2) the source region.

Luo however, fails to provide such a teaching. Rather, Luo recites at col. 7, lines 8-11, that the “body 10 may be heated to a dopant diffusion temperature for diffusing some of the dopant from the sidewall extension 30 into the body 10” (to form the doped source portion 13b). This does not teach or suggest *two distinct* and separate regions of the device – i.e., a source region (212) and a doped polycrystalline silicon region (215) as illustrated in the figures and specification and as recited in Claim 1 by Applicant (see also paragraphs [0051] –[0053]).

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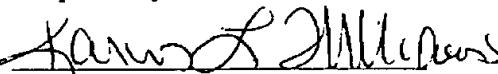
Independent Claim 16 is believed patentable over APA and Luo for at least the same reasons as independent Claim 1.

For all of the foregoing reasons, Applicant respectfully submits that each of independent Claims 1 and 16 are not rendered obvious or unpatentable over any permissible combination of the teachings of APA and Luo and that the rejection should be withdrawn.

Dependent Claims 2-15 are believed to be clearly patentable for all of the reasons indicated above with respect to amended independent Claim 1, from which they depend, and even further distinguish over the cited references by reciting additional distinguishing limitations.

Since the Applicants have fully responded to each rejection set out in the Office Action, it is respectfully submitted that in regard to the above remarks that the pending application is patentable over the art of record. Should the Examiner be of the view that an interview would expedite consideration of this Response After Final Rejection or of the application at large, request is made that the Examiner telephone the Applicants' undersigned attorney at (908) 518-7700 in order that any outstanding issues be resolved.

Respectfully submitted,

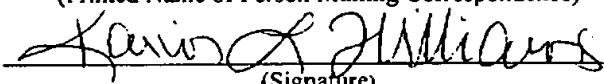
  
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